

# 2018 North American Drought Monitor Forum



Calgary, Alberta, Canada - May 1-3, 2018



## *An update on Drought Monitoring in Mexico*

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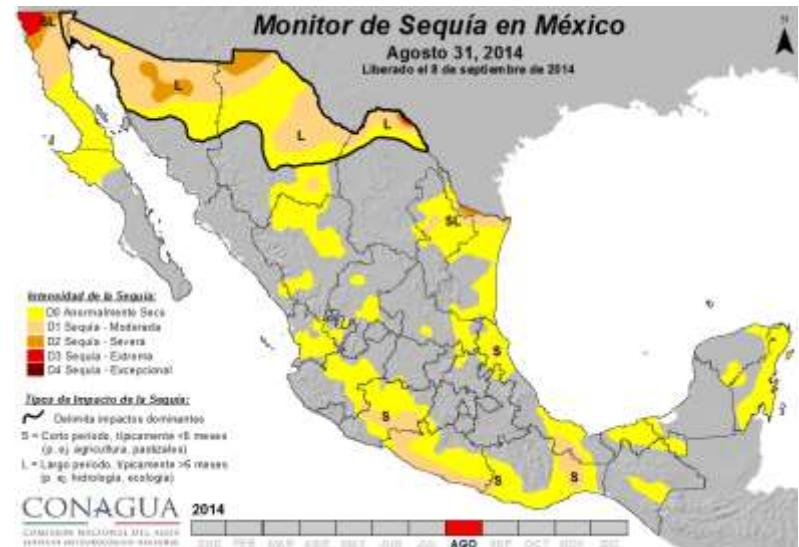
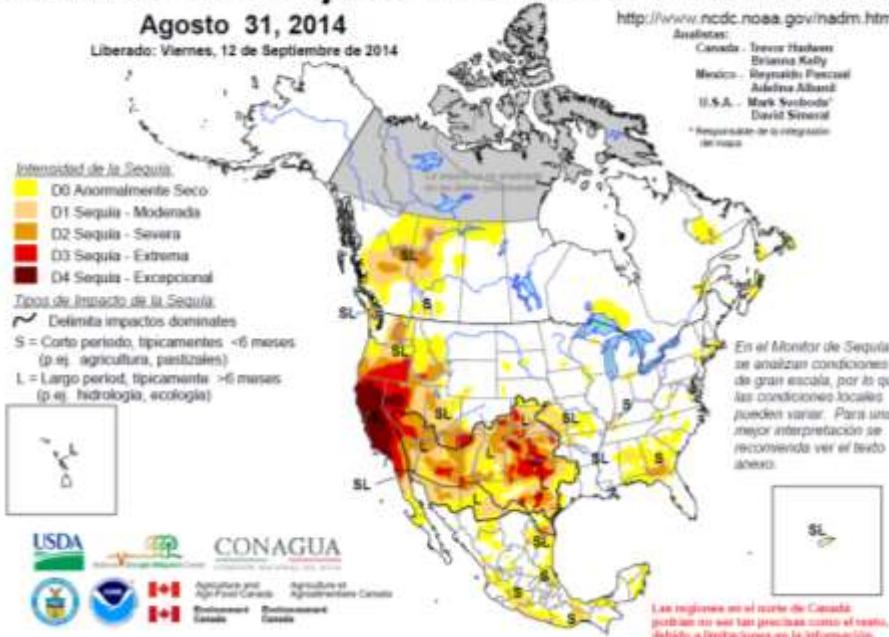
## Outline

- **Mexican Drought Monitor (MDM) background**
- **Indices and procedures used in MDM**
- **Results and next steps**
- **MOSEMM(Multiparametric Drought Monitor)**
- **MDM vs MOSEMM**

## Mexican Drought Monitor (MDM) context

Drought monitor activities began in Mexico in late 2002 with the inception of the NADM. Since that time, monthly drought tasks in SMN and whole Mexico were related to NADM. But in 2014, SMN launches the Mexican Drought Monitor (MDM or MSM in Spanish), an effort to separate continental to national drought maps.

### Monitor de Sequía de América del Norte



## Drought indices and procedures used in the MDM

The MDM is produced using a variety of drought indices and indicators represents drought behavior. MDM is based on the NADM drought classification.



**Abnormally Dry (D0):** Going into drought: short-term dryness slowing planting, growth of crops or pastures

Coming out of drought: some lingering water deficits, pastures or crops not fully recovered.

**Moderate Drought (D1):** Some damage to crops, pastures, streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested.

**Severe Drought (D2):** Crop or pasture losses likely; water shortages common; water restrictions imposed.

**Extreme Drought (D3):** Major crop/pasture losses; widespread water shortages or restrictions.

**Exceptional Drought (D4):** Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies.

### **Drought Impact Types:**

S= Short-Term, typically < 6 months (agriculture, grasslands)

L= Long-Term, typically > 6 months (hydrology, ecology)

## Drought indices and procedures used in the MDM

The MDM is produced using a variety of drought indices and indicators represents drought behavior. MDM is based on the NADM drought classification.

### METEOROLOGICAL

- The Standardized Precipitation Index (SPI-SMN)
- Percent of Normal Precipitation and anomaly/departures (SMN)

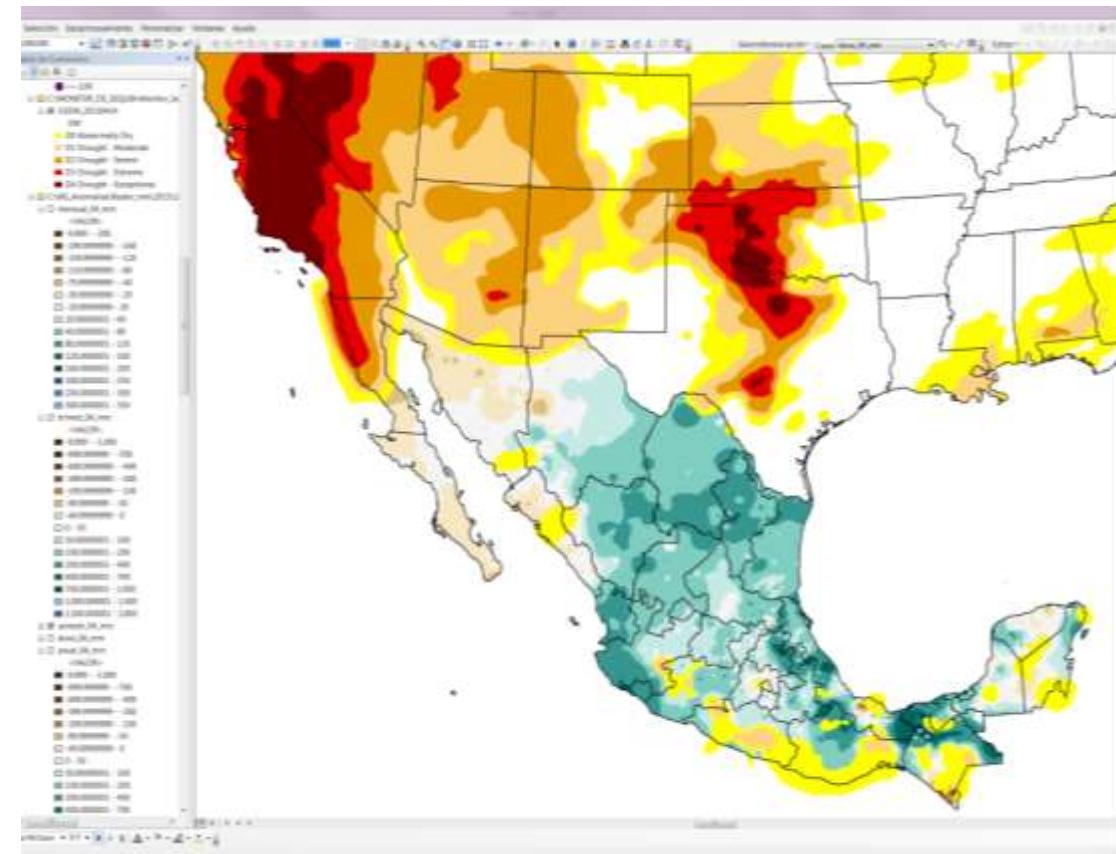
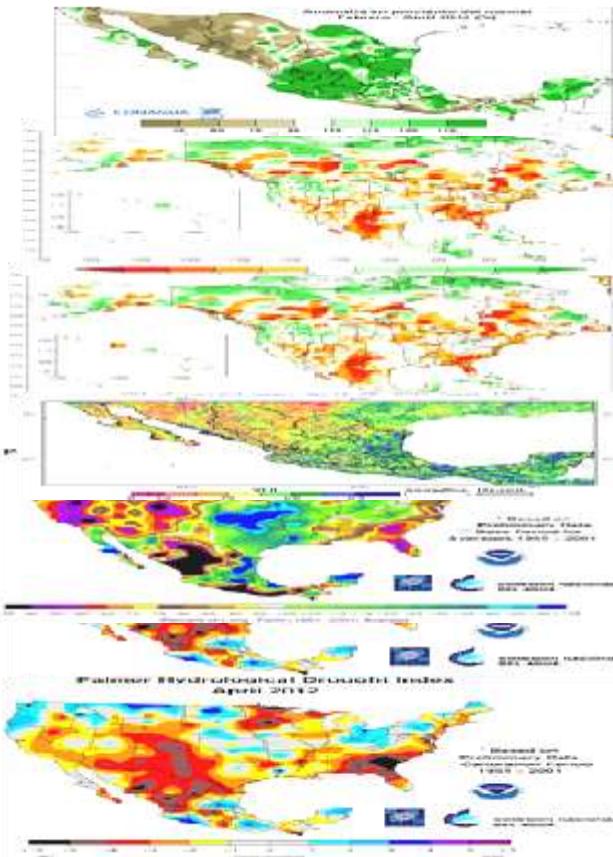
### HYDROLOGICAL

- Porcent of available water in reservoirs (indicator by CONAGUA)
- Leaky Bucket Soil Moisture Model (CPC-NOAA)

### VEGETATION

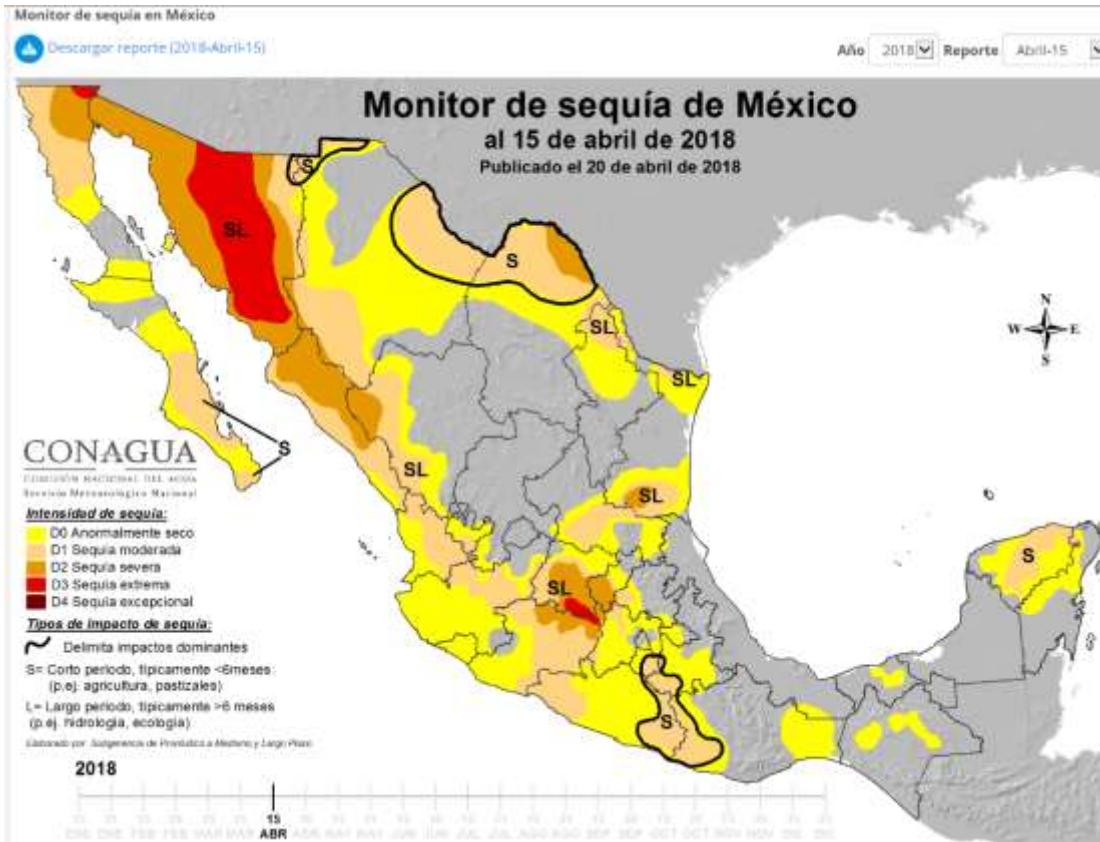
- Normalized Difference Vegetation Index (NDVI-SMN)
- Vegetation Health Index (NOAA-NESDIS)

# Drought indices and procedures used in the MDM



# Results (main MDM products)

Available on <http://smn.conagua.gob.mx/es/climatologia/monitor-de-sequia/monitor-de-sequia-en-mexico>

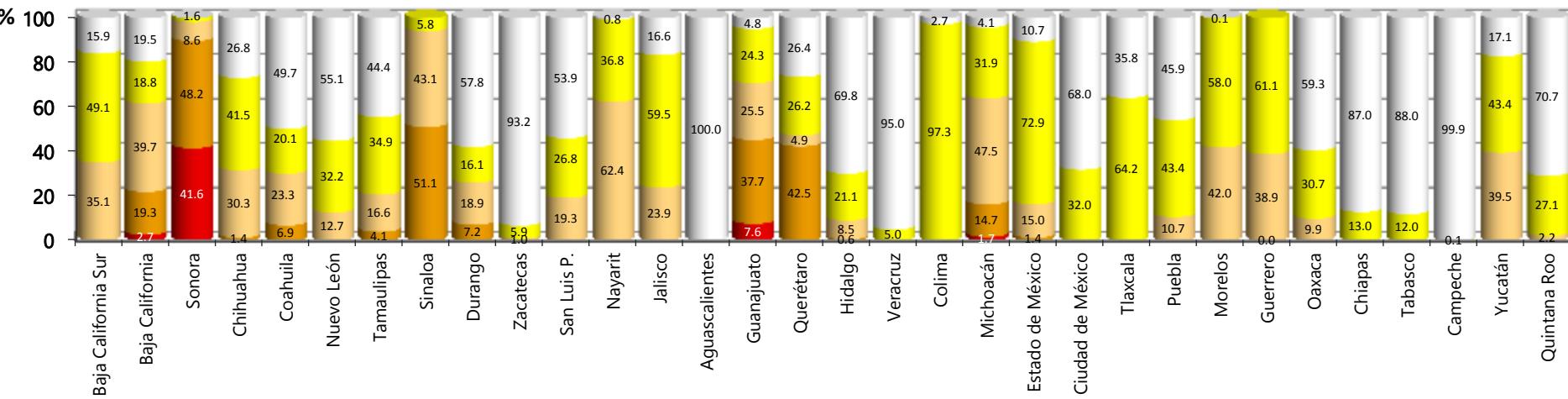
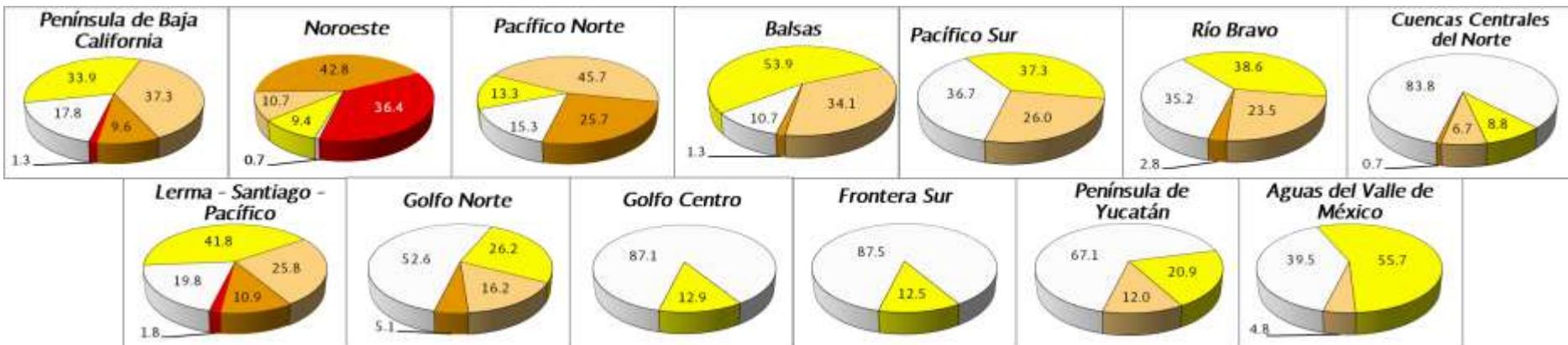


Durante los primeros 15 días de abril de 2018, se registraron lluvias por arriba de lo normal en porciones de los estados de la Vertiente del Golfo de México, Oaxaca, Chiapas y Quinta Roo debido al paso de cinco sistemas frontales (del número 40 al 44). Mientras que en el resto del territorio nacional continuaron condiciones secas, por lo que la sequía desde moderada (D1) a extrema (D3) se incrementó en el norte, noroeste, occidente y centro del país.

La sequía extrema (D3) aumentó en Sonora y en el centro del país, cubriendo el 4.12 % de la superficie nacional. La sequía severa (D2) se extendió en Sinaloa, Durango y el norte de Michoacán. En tanto que la sequía moderada (D1) tuvo un incremento en Nayarit, Michoacán, Guerrero, Oaxaca y la Península de Yucatán. A nivel nacional, al 15 de abril de 2018, el área con sequía desde moderada hasta extrema (D1-D3) es de 33.63 %, un incremento del 4.9% en comparación con lo observado el 31 de marzo de 2018.

# Results (main MDM products)

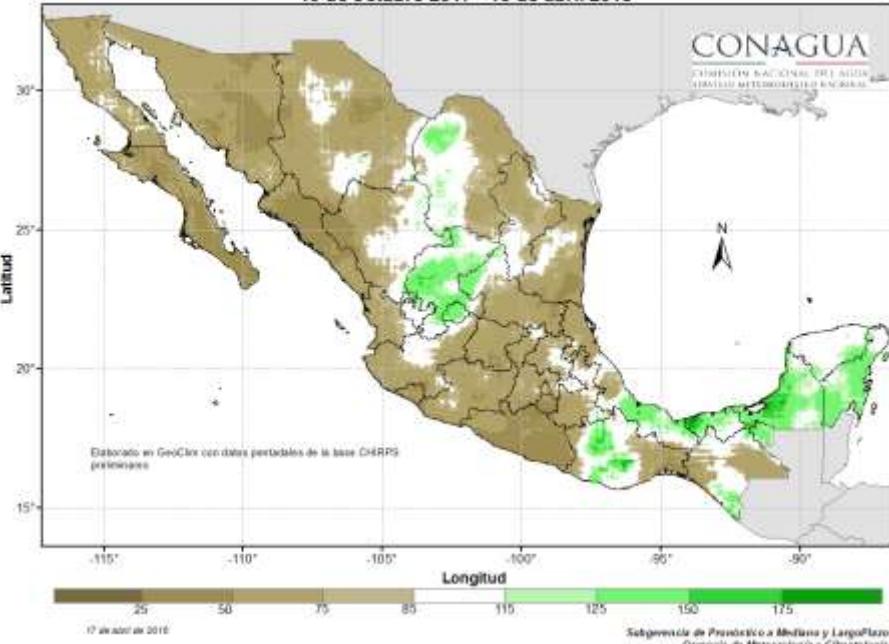
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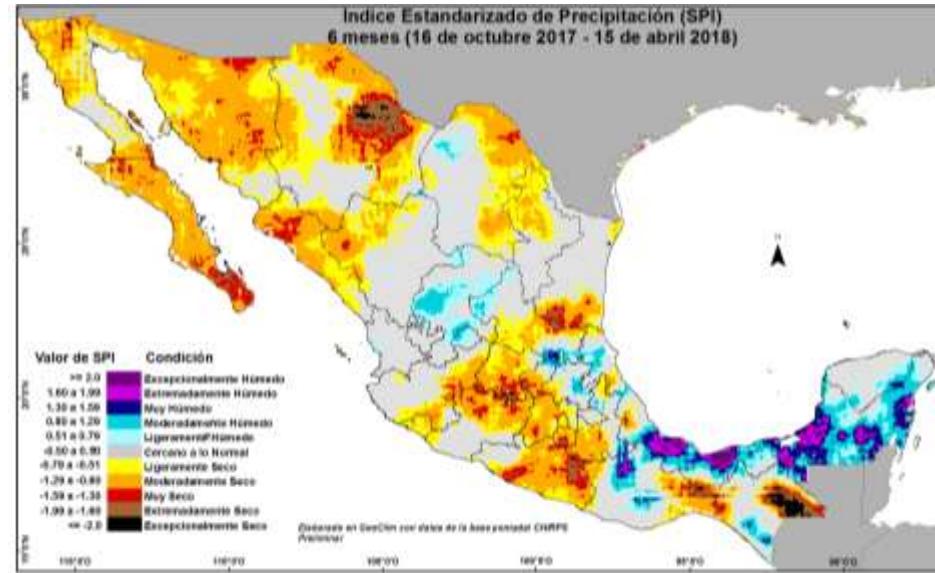
# Results (next steps)

CHIRPS\* data base has been evaluated to the produce SPI and precipitation anomalies for monthly and mid-month drought assessment, through monthly and pentadal grids.

Anomalia mensual en porciento de lo normal  
16 de octubre 2017 - 15 de abril 2018



Índice Estandarizado de Precipitación (SPI)  
6 meses (16 de octubre 2017 - 15 de abril 2018)



\*Climate Hazards Group InfraRed Precipitation with Station data (**CHIRPS**) is a 30+ year quasi-global rainfall dataset. Spanning 50°S-50°N (and all longitudes), starting in 1981 to near-present, CHIRPS incorporates 0.05° resolution satellite imagery with in-situ station data to create gridded rainfall time series for trend analysis and seasonal drought monitoring.  
<http://chg.geog.ucsb.edu/data/chirps/>

- To built a temperatura data base in CHIRPS format (\*.bil)
- Then, calculate evapotranspiration maps over Mexico.
- The SPEI index is still a pending task in the SMN.

# MOSEMM (The Multi-parametric Drought Monitor)

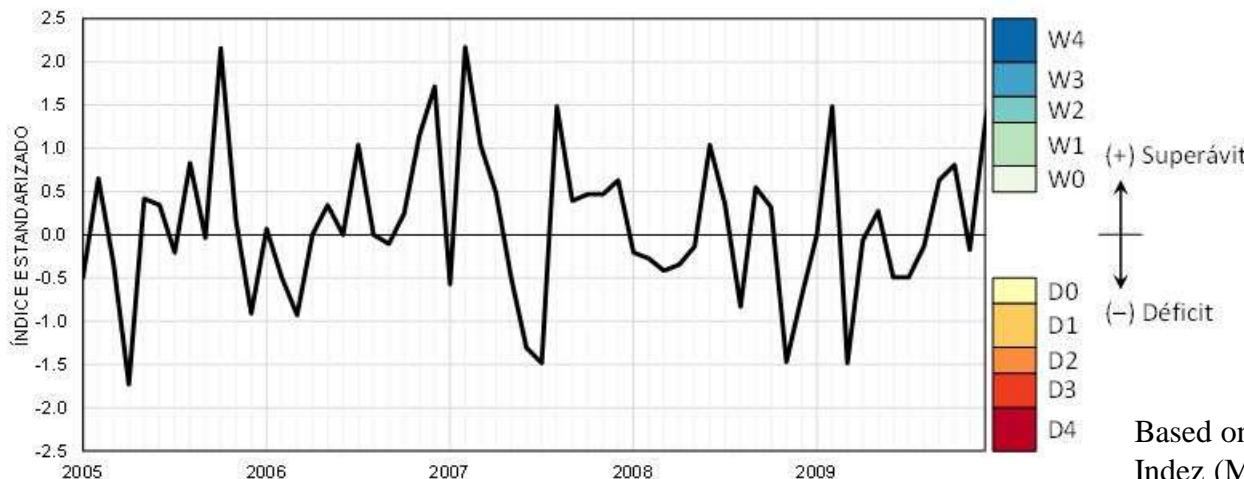
The MOSEMM is an effort from CONAGUA and UNAM to produce objective drought maps on a monthly basis from 1, 3, 6, 9 and 12 past months. Uses data from GLDAS – Global Land Data Assimilation System, and MERRA - Modern-Era Retrospective Analysis for Research and Applications, from NASA.

Based on 3 index:

Precipitation: Standardized Precipitation Index (SPI)  
Soil moisture. Standardized Soil Moisture Index (SSI)  
Runoff: Standardized Runoff Index (SRI)

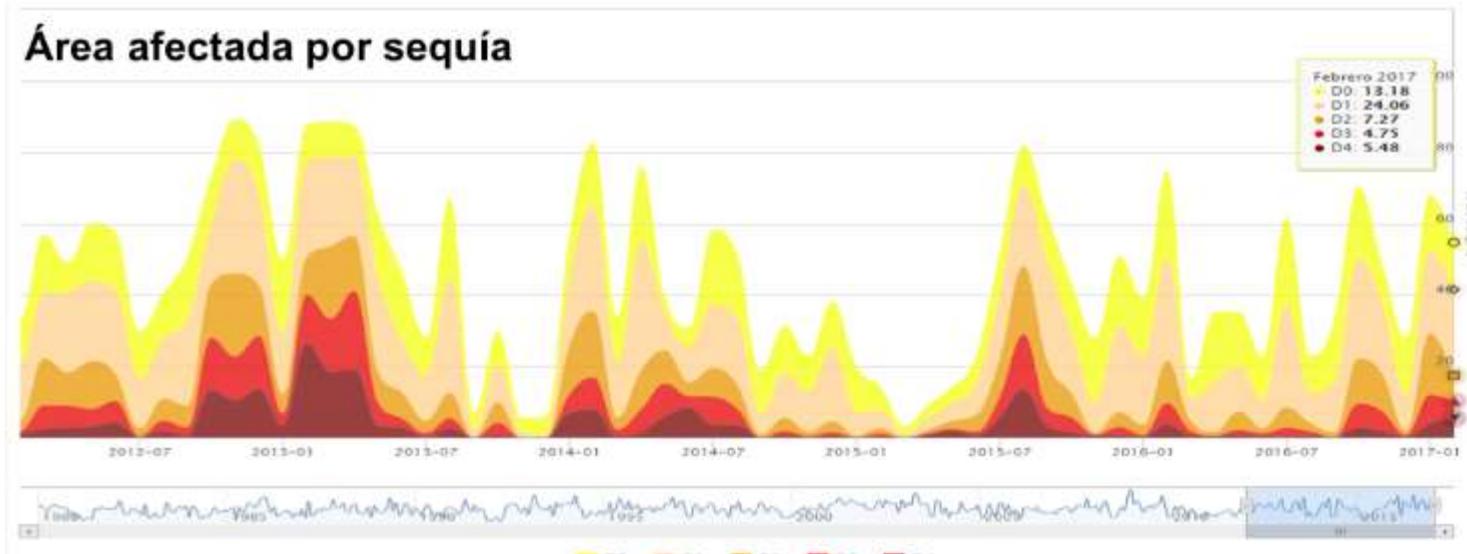
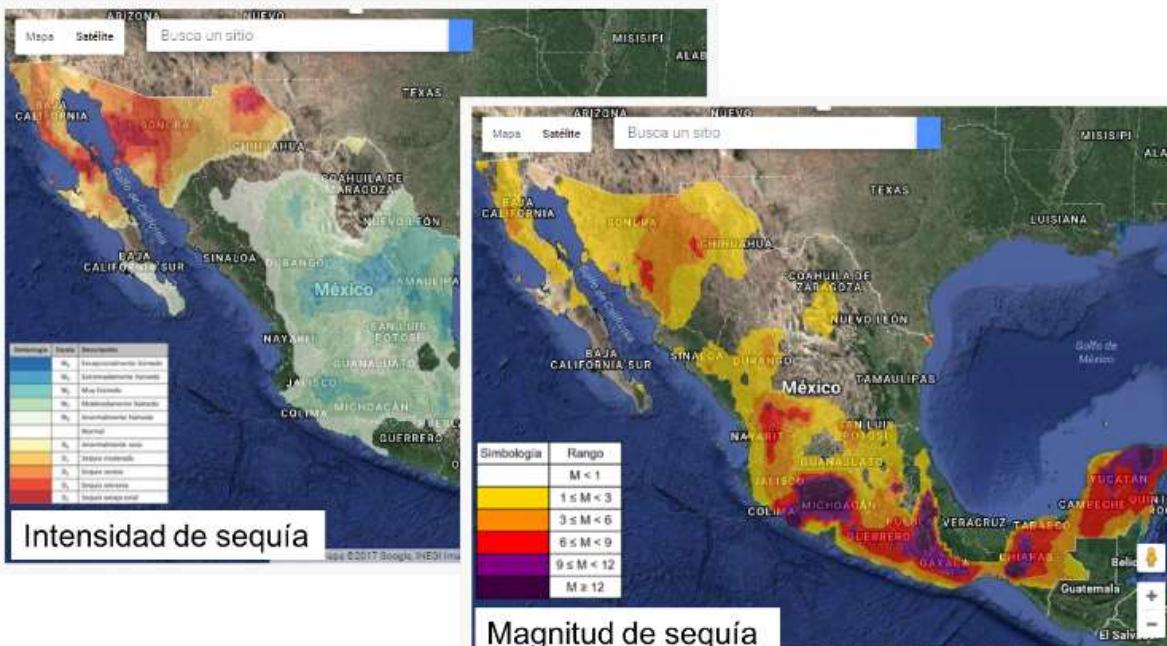
Outputs are a combination of them:

- Precipitation + Soil Moisture = MultiStandardized Drought Index (a)
- Precipitation + Runoff = MultiStandardized Drought Index (b)
- Precipitation + Soil Moisture + Runoff = MultiStandardized Drought Index (c)



Based on the Multivariate Standardized Drought Index (MSDI), Hao and AghaKouchak (2013)

## **MOSEMM (The Multi-parametric Drought Monitor)**



## MDM and MOSEMM

	MDM	MOSEMM
	SPI (Precipitation)	SPI (Precipitation)
	Leaky Bucket (Soil moisture)	SRI (Soil moisture)
Index used	Anomalies (Precipitation)	SRI (Runoff)
	NDVI (Vegetation)	
	VHI (Vegetation)	
Indicators	Water availability (reservoirs)	None
Determination	Consensus	Model
Release	Monthly, every 15 days	Monthly, every 30 days
Lag	5 to 10 days after	25 to 30 days after

# *The SMN Mexican Drought Monitor Team*

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**CONAGUA**

COMISIÓN NACIONAL DEL AGUA

Servicio Meteorológico Nacional

***MOSEMM***

***CONAGUA-SGT-UNAM***